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1994/08/00

## CHINA'S ELECTRONICS SECTOR

### Issues and Background

China is initiating an ambitious plan—including increased subsidies and low-interest loans—to develop an internationally competitive electronics industry by the year 2010. Chinese officials predict that a 20- to 25-percent annual growth rate will allow China to become the world's fourth largest electronics producer by the year 2000—it ranked ninth in 1993—with output value ranging between \$50 to \$75 billion. Foreign funding and joint ventures are already providing much of the technology and manufacturing equipment needed to meet China's goals in telecommunications, computers, microelectronics, and military electronics; by the end of 1993, more than 5,000 electronics enterprises had overseas investment, with contracted funds totalling \$3.5 billion, according to press reports.

### **Microelectronics**

Technologically, China's microelectronics production facilities are approximately eight to ten years behind the United States and Japan. To narrow the gap, Beijing is investing heavily in its production base, spending nearly \$7 billion on the microelectronics sector between 1993 and 2000, according to press reports. China's chief goal under the Eighth Five-Year Plan (1991-95) is to further the development of more sophisticated silicon technologies. Other priorities include research and development of gallium arsenide integrated circuits—which operate at higher speeds and are more tolerant to heat and radiation than silicon-based devices—and development of an indigenous capability to build electronic test equipment, instrumentation, and electronic materials.

Recognizing its technical shortcomings, China wants to form joint ventures and acquire microelectronics production equipment, technology, and expertise from developed countries. Domestic investments and joint ventures will supply China with the production technology and expertise required to be competitive in certain high volume, low profit, consumer items. But it is unlikely that a joint venture partner will provide China with the capability to become a leader and competitor in the field. China is therefore likely to remain at least a generation—2 to 4 years—behind the United States and Japan in the microelectronic devices it mass produces.

### **Computers**

The Eighth Five-Year Plan also places a priority on indigenous development of China's computer manufacturing infrastructure. Indeed, Chinese authorities plan to invest roughly \$3 billion between 1993 and 2000 to raise the output of the computer industry from the current one percent to 3-4 percent of gross national product. While macroeconomic restructuring may dampen those plans somewhat, the industry remains a top priority for funding. Chinese computer technology is, in general, five or more years behind that of the US, Western Europe, and Japan. Key development goals include acquiring advanced foreign technology through joint ventures to produce greater numbers of high-performance microcomputers and workstations, as well as creating a large-scale software engineering industry. The Chinese have identified nine

"Silicon Valleys," or centers of non-governmental high-technology companies, to work on computer research and development projects.

Chinese factories are slowly expanding their production of computer models—already obsolete by Western standards—for the internal market, but are increasingly unable to meet the needs of domestic consumers. Even with demand for PCs rising 80 percent in 1993, Chinese market share continues to fall. Imports and products assembled through joint ventures will probably dominate the market for the foreseeable future.

China also remains far behind the United States and Japan in high-performance computer systems, despite Chinese claims to the contrary. The much-publicized Chinese "Galaxy" series of near-supercomputers have been produced only in small numbers, and reportedly suffer from severe reliability problems. Several parallel-processing computer systems are under development at various Chinese universities and industrial research centers, but none can seriously claim to be beyond the experimental stage. Although China has applied its indigenously-developed computers to such demanding missions as meteorology and petroleum exploration, Beijing's continuing drive to purchase supercomputers from Cray, Convex, and other Western manufacturers strongly suggests that Chinese end-users do not find their needs satisfied by home-grown versions.

In the software field, the Chinese have referred to their efforts as "much thunder but little rain." In addition to encouraging indigenous software development enterprises, China is seeking to form joint ventures with foreign firms, as well as to win programming design projects from foreign manufacturers. Much Chinese work on advanced software development issues—such as artificial intelligence programming—has been supported not for its own sake, but to build professional skills and to permit China to keep up with the rest of the world's technical advances.

**US Angle.** Market estimates are difficult to derive because a large portion of China's electronics trade takes place on the grey and black markets. But China's microelectronics production investment program as well as the loosening of Western export controls—particularly since the demise of the Coordinating Committee for Multilateral Export Controls (COCOM)—will provide good opportunities for US firms to form joint ventures and sell production facilities, equipment, and expertise. At the same time, China will remain dependent on the United States and Japan for higher-end computers—workstations to supercomputers. For lower power—personal computer-type—computers China will probably look to imports from the United States and other Asian countries such as Taiwan, as well as to indigenous production using foreign-produced components and boards.